

REMARKS

In the Specification

1. The paragraph under the "Claim of Priority" section has been amended to indicate the proper date for the claim of priority.
2. The first paragraph under the "Background of the Invention" section has been amended to correct a typographical error.
3. The second paragraph on page 9 has been amended to correct a typographical error.
4. The first paragraph under the sub-heading "Alice and Bob Detector Self-Calibration" has been amended to correct two typographical errors.

In the Claims

Claims 1-13 have been amended, and claim 14 has been canceled. Independent claims 1 and 7 have been amended so that they include the limitation that the average number of incoming and outgoing radiation pulses are counted and compared in a given time interval to determine if an eavesdropper is eavesdropping by adding extra pulses.

The claims have also been amended to remove the word "reflecting" to describe the key-encoding station, as it is redundant.

Also, the claims have been amended so that the phrase "radiation pulse" is used consistently throughout.

Claim 10 has been amended so that the last words in the claim are "single-photon detector" rather than just "detector."

Claim 12 has also been amended so that it depends from claim 11 rather than from claim 7.

The claim amendments are discussed further below in the context of the various rejections asserted in the Office Action.

Rejection under 35 USC § 101

Claims 7-14 were rejected under 35 USC § 101 as being directed to "an abstract idea" and thus non-statutory subject matter.

Applicant respectfully submits that the pending claims are directed to statutory subject matter under 35 USC § 101. Independent claim 1 and claims 2 through 6 depending therefrom are directed to an apparatus ("machine") in the form of a key encoding station for quantum cryptography that is uniquely adapted to count incoming and outgoing radiation pulses using a single-photon detector. This is a tangible result and is most certainly subject matter under 35 USC § 101.

Independent claim 7 and claims 8 through 13 depending therefrom are directed to a method ("process") of improving the security of a QKD system that involves a novel approach of counting the incoming and outgoing radiation pulses to a QKD station using a single photon detector, and comparing the result to determine if an eavesdropper is trying to breach the security of the system by eavesdropping using radiation pulses. This method provides a tangible result in the form of counted radiation pulses and so is clearly statutory subject matter under 35 USC § 101.

In view of the above, Assignee respectfully submits that the pending claims 1-13 are statutory subject matter under 35 USC § 101, and respectfully requests that this rejection of the claims be withdrawn.

Rejection under 35 USC § 103

Claims 1-14 were rejected under 35 USC § 103(a) as being unpatentable over Bethune et al. (U.S. Patent No. 6,188,768) ("Bethune") in view of Townsend (U.S. Patent No. 5,953,421 ("Townsend")).

In rejecting independent claims 1 and 7, the Examiner states in the Office Action (see, e.g., page 4, last paragraph and page 7, third paragraph), that Bethune discloses a single-photon detector in the form of power meter monitor (28). However, **power meter (28) is not a single-photon detector**. A power meter, by definition, detects optical power and thus cannot detect single photons or even weak optical signals (i.e., optical signals having a few photons). Rather, a power meter measures an amount of power in relatively strong multi-photon optical signals (i.e., optical signals having many hundreds or thousands of photons).

On the other hand, a single-photon detector generates a "click" that indicates the detection of a radiation pulse having either a large number of

photons or as few as a single photon, without any indication of the amount of power in the optical pulse. The single-photon detector therefore simply registers the presence of an optical (radiation) pulse—but can do so for pulse having only one photon. Thus, a power meter **cannot** be used to detect the presence of an eavesdropper that uses weak or single-photon pulses to gain information about state of the QKD system.

The Examiner later recognizes that the power meter is not a single-photon detector, and states (see, e.g., page 5, last paragraph, and page 7, fourth paragraph) that it would have been obvious to replace the power meter (28) in Bethune with the single-photon detector of Townsend. However, Townsend does not include a single-photon detector at a QKD station where radiation pulses are enter **and** leave the QKD station. The single-photon detector of Townsend is used to detect single-photons being exchanged between the QKD stations and cannot play the secondary “watch dog” role of detecting an eavesdropper in the manner of Assignee's claimed invention.

Accordingly, there is no motivation for one skilled in the art to use the single-photon detector of Townsend in place of Bethune's power meter. There is also no teaching in Townsend or Bethune about how to use the “clicks” from a single-photon detector to detect the presence of an eavesdropper per Assignee's claimed invention.

Independent claims 1 and 7 have been amended to add the limitation that the single-photon detector is used to count the average number of incoming and outgoing radiation pulses over a given time interval to determine whether an eavesdropper is adding radiation pulses to the system in an attempt to eavesdrop and gain information about the system. Neither Bethune nor Townsend teach or suggest this particular use of a single-photon detector in detecting the presence of an eavesdropper.

Accordingly, as the cited prior art does not contain all of the claim limitations in claims 1-13 as currently presented, the Assignee respectfully submits that the as amended are not obvious in view of Bethune and Townsend, and that the rejection of the pending claims under 35 USC § 103(a) be withdrawn.



CONCLUSION

In view of the above amendments and remarks, Assignee submits that pending claims are patentable and are in condition for allowance. Accordingly, allowance of the pending claims and a Notice of Allowance of the application is earnestly requested.

Joseph E. Gortych

Joseph E. Gortych (Reg. No. 41,791)

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Correspondence Address (Customer #53590)

Opticus IP Law, PLLC
7791 Alister Mackenzie Dr.
Sarasota, FL 34240

Phone: 941-378-2744

Fax: 321-256-5100